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IRRIGATION AND AGRICULTURE

IN THE

FIRST FIVE YEAR PLAN AN APPRAISAL

BY

Rao Bahadur **N S JOSHI,** POONA & *Prof* **B R DHEKNEY** DHARWAR

ABRIDGED EDITION

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PREFACE

This abridged critique of the First Five Year Plan is being published four years after the inauguration of the Plan. The delay was unavoidable as (1) the Plan itself was not available to the public till two year after its commencement and (2) relevant information called for from Government was not available even after several reminders.

The full text of "An Appraisal" of Irrigation and Agricultural schemes in the First Five Year Plan has been published in a book of 170 pages. It includes over 50 tables in support of the "Appraisal", the discussions and the findings. Many friends suggested that it would be very useful from the point of view of the layman reader to have an abridgement of the full volume deleting the numerous tables and the more detailed discussion. Hence this abridged edition in less than 50 pages. The intention behind the publication of the abridged edition is to bring home to the non technical tax payer that the out turn particularly of food grain envisaged in the Five Year Plan is extremely exaggerated. Had the actual returns been say even 75% of those envisaged, this book would not have been written. In fact had it been possible to so modify the irrigation schemes that by an expenditure of about 25% more on remodelling the projects the targets would be attained before the close of the Second Five Year Plan the "Appraisal" or its present abridgement would not have been published.

Again had it been possible to verify the success or failure of the schemes by direct measurement or had instruments been provided making an appraisal possible or easy there would have been some hope of the mistakes being detected in time. As it is no such check is possible and we will therefore realize the situation only after it is too late i. e. when we will be swooning by sheer exhaustion. We are at present not in a mood to learn by past experience. Such a wise course does not fit in with the high ambitions aroused in us at present. Our first need is to create means of an easy but direct measurement of the increase in (food grain and other agricultural) production to allow the same to be compared with that envisaged in the Plan. Probably the worst feature of the Plan is that it leads the tax payer into a false sense of security and makes him believe that the Country was going to have a milleneum shortly. Our ambitions have made us so credulous as to create a confidence that food shortage was already made up by the schemes in the Five Year Plan before 40% of the capital on works was spent and before water from our irrigation schemes had actually even reached the fields.

It is hoped that the defects recorded will be scrupolously avoided in the second five year plan at least.

Saraswati-Sadan
8-4-1955

to another and all this ended in thin air Even in the case of the Government of India we were driven from pillar to post And this went on merrily for quite a long time to our utter discomfort and disappointment We invite the attention of our readers to these facts only with a view to indicating the *serious* handicaps under which we had to conduct the enquiry

It is indeed difficult to explain why the Planning Commission and the State authorities were unable to supply the information we asked *for* If several months are wasted in merely awaiting information the *very* purpose of study and scrutiny is bound to be defeated The inordinate delay involved in the publication of this *critique* has been largely due to lack of response or belated and inadequate response from the authorities concerned

It would be readily agreed that for any objective evaluation of plans one must be sufficiently equipped with the basic data It will also be conceded we hope, that all human efforts were made to secure facts If therefore in the
pages we have many occasions to dispute and to assail the calcula
the Commission we cannot at least be accused of hitting below the

Thus defeated in our endeavours we decided to examine the schemes of Irrigation and agricultural development with the help of such material as was at our disposal

(2) VERIFICATION OF STATISTICAL DATA

The major part of the capital outlay in the agricultural field is intended to be devoted to various irrigation schemes The Report mentions 72 major irrigation schemes (vide page 79 of the Report) each costing from Rs 10 lakhs to Rs 5 crores and above With a view to verifying this number we counted the number of Major Irrigation schemes mentioned in the D S V and found to our surprise that it was 188 Even after excluding all doubtful cases the number of major irrigation schemes according to our count stands at 115 [1] Even if we exclude from the count the various Tube-wells' schemes included by the Commission in Statement V of the D S V the number still exceeds 100 !! We are, therefore at a loss to know how the Commission could have arrived at the figure of 72

Detailed information as regards the costs of the various schemes of development and the benefits expected of them has been furnished in the supplementary volume on Development Schemes Figures of expenditure have also been given in an abstract in the same volume It is however, surprising that the two sets of figures (those in the abstract and those in the detailed list) do not always agree. Sometimes the expenditure in the abstract table exceeds that in the detailed lists, sometimes it is the other way round [1] In the case of the Bombay State for instance the difference in the two sets of figures of expenditure amounts to Rs 631 lakhs This is sought to be explained by the following statement made in the preface to the volume on " Development Schemes —

In other fields of development for Part A and Part B States schemes involving expenditure in excess of Rs 10 lakhs h ve been listed In addition there are a number of smaller schemes in the States which are not separately indicated here

We would then like to ask would it not have been both possible and desirable to group such smaller schemes together and show them under appropriate heads? The people have a right to know about the extent of utility of such smaller schemes though it may not be convenient to make a separate mention of each

But when we try to verify the figures of expenditure of some other States even the explanation proffered by the preface does not hold good The following Table *reproduces the expenditure data in regard to some States*—

Capital provided for certain States under the

Sub-Head Agriculture in the D S V

Name of the State	Expenditure shown in the abstract table page 4 5 of the D S V	Expenditure in the detailed lists pages 96 to 123 of the D.S V	Deficient provision of capital (col 3 2)
	Lakh Rupees	Lakh Rupees	Lakh Rupees
1	2	3	4
1 Assam	2,6	312	36
2 Madhya Pradesh	1005	19"6	921
3 Madras	1594	5350	3"56
4 Uttar Pradesh	?096	2484	388
Total			5101

It will be seen that in the case of these four States the expenditure in the detailed lists exceeds that given in the abstract table by no less than Rs 5101 lakhs Now this difference of Rs 5101 lakhs cannot be explained on the ground that schemes involving an investment of less than Rs 10 lakhs each in the case of Part A and Part B States, etc have been deleted from the detailed lists! The question is which figures of expenditure are definitive—those given in the abstract table or those given in the detailed lists ? In case some of the schemes from the detailed lists are omitted which are they and why *are they printed in the lists in the D S V at all ? The figures for* are astounding ! The detailed list gives names and costs for sche—

Rs. 5850 lakhs but the abstract table provides for an expenditure of Rs 1594 lakhs only the unexplained difference being 286% of the provision ! It would be hard to meet with a worse example of careless social accounting than this !

The Central Government has an unexplained difference of Rs 3·74 crores In other words schemes involving an expenditure of Rs 3·74 crores do not find any mention in the D S V The explanation provided in the preface and referred to above is not applicable to the schemes of the Central Government Why are these schemes not mentioned in the volume at all ?

Unfortunately our difficulties with regard to verification of statistical data are not confined to figures of expenditure only They extend over a wider field Let us examine figures of areas irrigable by Major Irrigation These figures are presented at three different places as under —

(1) Page ??0 of the Report
(2) Page 379 of the Report
(3) Page 129 of the D S V

A reference will show that the areas to be irrigated differ widely in respect of the following eight States.

(1) Bihar (2) Orissa (3) Punjab (4) Uttar Pradesh (5) West Bengal (6) Jammu and Kashmir, (7) Pepsu and (8) Rajasthan

For a quite a long time one does not understand why these figures of areas do not agree Actually we had to waste a good deal of our time and energy in finding out the reasons for the divergence in the figures We had to make our way through the labyrinth of figures with considerable difficulty before we could get some clues The confusion which the disparity in the different sets of figures causes at least in the initial stages could have been easily avoided if adequate explanatory notes had been added to each of the three tables

The Report states that a capital outlay of Rs 125 crores on various agricultural schemes would provide an additional output of 6 0 million tons of food grains It is really a riddle as to how the Planning Commission could have arrived at this figure of Rs 125 crores At the current market rates, the value of 6 million tons of food-grains would exceed Rs 250 crores This would mean in other words that an investment of annas 8 only on Government schemes in the agricultural field would provide a rupee worth of additional food every year The absurdity of this proposition will be evident by comparison with investments on existing irrigation schemes

worked out in consultation with State Governments which will yield 6 0 million tons net of additional food grains at a cost Rs 125 crores It will be seen that the two statements do not convey the same meaning The latter may indicate inclusion of multipurpose projects undertaken by the Central Govern ment but not the former

When we made an attempt to allocate (from figures in the Report) the costs of the aforementioned measures to additional food output it was dis covered that Rs [illegible]00 crores would be the rock bottom cost of the same even assuming the figures of capital and those of output as given in the Report to be correct We have shown that the capital has been underestimated and the output very seriously overestimated

Since there has been no reliable information as regards the calculations of the Planning Commission which have led them to the figure of Rs 125 crores all that can be attempted is a guess We tried all sorts of permutations and combinations we could possibly imagine but none except the following would give the figure of Rs 125 crores quoted in the Report As a last attempt we added up the figures of expenditure under the sub head Agriculture for all the States including that of Jammu and Kashmir This process does give the figure of Rs 125 crores as shown below (Reproduced from Pages 5 to 9 of D S V)

Part	A	States	= Rs	9108 2 lakhs
Part	B	States	= Rs	2771 0
Part	C	States	= Rs	598 7
Jammu & Kashmir			= Rs	[illegible] 1
		Total	= Rs	12500 0

The fact that the above operation gives the desired figure of exactly Rs 125 crores leaves room for a sneaking suspicion that the Planning Commi ssion worked out the figure of Rs 125 crores as above and tagged on the figure of 6 million tons of food grains to the same though actually 2 million tons out of 6 Millions are expected from Major irrigation schemes

(3) Verification of statistical data (continued)

We have pointed out that the statistical data relating to irrigation and other schemes of agricultural development are woefully deficient in important respects and also the manner in which the available data are presented does not make for an easy and clear understanding Apart from this there are other cases of obvious anomalies and incongruities in the statistical data we propose to invite attention in the following paragraphs to a few more glaring instances of these

The supplementary volume on Development Schemes includes a short preface the ostensible purpose of which is to guide the reader in the understandin of the statistical material presented in that volume Unfortun

however the preface has been written so indifferently that the reader is apt to be confused and misled A few instances of this confusion may with advantage be cited The preface states All irrigation and power schemes whether Central or State are shown together in one Statement From the words irrigation and power schemes the statement referred to appears to be Statement V in the D S V Actually however a large number of (Minor) irrigation schemes are shown in Statement IV and some in Statement V of the D S V One begins to wonder whether according to the Planning Commission these Minor irrigation schemes shown in Statement IV are not irrigation schemes at all One would have connived at this were all Minor irrigation schemes included in Statement IV That however is not the case In regard to some States at least some Minor irrigation schemes have been included in Statement V and the capital provision on their account has been lumped together and shown against them The remaining Minor irrigation works for the same State have been included in Statement IV No reasons have been given for putting some Minor irrigation works in Statement IV and some in Statement V

It appears that the Planning Commission did not pay adequate attention *to the proper classification of their schemes They seem to have merely published* the lists of schemes as they were received from the State Governments All areas under minor irrigation should naturally have been included in Statement IV of the D S V As stated above however a good few Minor irrigation schemes are also included in Statement V sometimes called by the very name Minor Irrigation and sometimes styled as Other Schemes or New G M F etc Obviously it was improper to show figures like the areas to be irrigated by these minor projects under Major Irrigation

It is also strange that a few obviously non irrigation schemes have been included in the lists of State Irrigation Projects The Navigation embankment and drainage projects and Protection of Dibrugarh town in Assam and Drainage of Chaurs etc and flood protection schemes in Bihar are the important instances of the kind The importance and necessity of these schemes are not in dispute But by no stretch of imagination could these schemes be considered as Irrigation schemes

There are again certain Irrigation schemes in the State of Jammu and Kashmir and which are described as land reclamation stabilization and protection from flood We would like to ask what sort of irrigation schemes are these where the additional areas are to be irrigated by such measures as Reclamation Protection against floods and Stabilization We fail to understand how additional areas could be irrigated by measures like protection against floods and how more than one lakh acres could be provided with irrigation in a State like Kashmir as a result of Reclamation and Stabilization

There are again a number of State irrigation Schemes the benefits of which in terms of additional areas irrigated would not be available at all at the end of the period of the plan i.e. 1955-56 although full costs of these

schemes will have been incurred by that time In point of absurdity however two schemes in the Madras State and one in the Mysore State are really unique The Cauvery Delta Drainage scheme and the New G M F Schemes in charge of Public Works Department in the Madras State, together costing no less than Rs 434 lakhs will not confer any benefits in terms of areas irrigated not only during the period of the Plan but also on their completion! This merely confirms our suspicion that these two are not irrigation schemes at all

We were also astonished to find that Part C States ri Ajmer Cutch and Himachal Pradesh do not obtain any food grains from their State Irrigation Schemes

It is to be recorded further that the targets or the results of the various schemes of agricultural development have not been expressed in uniform terms We have also noticed many cases of palpable anomalies In Madhya Pradesh there is one scheme of land reclamation called Reclamation of cultivable waste and from weeds by mechanical cultivation by C T O tractors The total cost of this scheme is nearly Rs 2? lakhs all to be spent before 1955 56 The area expected to be reclaimed by this scheme by 1955–56 would be 6 000 acres only This means that the cost of reclamation would be Rs 3 700 per acre! In the same State there are two schemes of improved seeds which together would involve an investment of Rs ?85 5 lakhs during the five year period The targets of these schemes are expressed in terms of 7 83 259 maunds *of seeds or about 5 000 tons The value of seeds thus works out at about* Rs 1 100 per ton! The absurdity of this phenomenon is yet to be fully realised The production, distribution and use of these ?5 000 tons of improved seeds are expected to yield an additional food output of ?000 tons only This means in other words that the cost of additional food production on account of improved seeds would amount to Rs 11 400 per ton ! Compare this with the price of food-grains per ton which is about Rs 430 only

It is interesting to note that the additional production of sugar cane in Hyderabad State is shown to be nil But it is difficult to reconcile this with the testimony provided by some other authorities on this issue e g a technical paper on the Tungabhadra Project written by a responsible engineer of the State which records that the area under sugar-cane on the Hyderabad side of the Tungabhadra Canal would be ?0 000 acres Another project Rajolibunda in the same State and to be completed by 1955 56 is expected to bring under sugar-cane an area of about 8 000 acres *These ?8 000 acres should be able* to provide an output of about 1 0 000 tons of sugar and gur

On the other hand in the State of Bombay the Planners aspire to obtain an additional output of 87 000 tons of sugar Actually Appendix II at pages 18–219 of the Report uses the word Sugarcane It is unfortunate that the same mistake has occurred in other places in the Report by 1955 56 It is necessary to mention in this connection that none of Bombay s

irrigation schemes with the exception of the Gangapur Project could be expected to provide large areas of sugar cane The Gangapur storage project was originally intended it is understood to irrigate about 6 400 acres of sugar cane Even however supposing that the contents of Gangapur were increased somewhat the production of additional sugar or Gur would be of the order of 28 000 tons and cannot exceed 30 000 tons

There is probably one explanation that may be offered by some viz that 59 000 tons of sugar and gur (difference between 87 000 tons and 28 000 tons the latter from Gangapur) may be available from Minor Irrigation works Such an explanation would be ridiculous In any case if that were accepted as a plausible explanation the nil figure of sugar in Hyderabad would appear to be even more absurd

(4) DILEMMAS

Apart from the various anomalies revealed by the examination of the statistical material presented in the Report and the D S V there are certain dilemmatic aspects of the irrigation schemes to which we invite the attention of readers

So far as we can gather the main purpose of the Plan in the agricultural and irrigation sections is large scale production (both of grain and commercial commodities) and self sufficiency regarding food (vide Chapter XIV of the Report) It is also generally desired and expected that the irrigation facilities would be equitably distributed and that protection from famine will also be achieved It is difficult to see how the two purposes could be achieved at the same time

Though the Report itself does not clearly state equitable distribution or protection from famine as the objective of irrigation schemes individual reports on schemes do indicate that to be one of the aims though not always the main aim A mix up of ideas is thus evinced with the result that every scheme is represented as a famine protection scheme It appears that designers believe that a famine gives respectability to their schemes in the eyes of the public and of the sanctioning authorities As a result it has become common practice to include protection from famine equitable distribution of irrigation facilities and large scale production as 3 objects achieved by nearly each scheme of irrigation That is both impossible and misleading

Among the sources mentioned as contributing additional food and other produce are manures and fertilizers and improved seeds An impression is likely to be carried that the expenditure on these measures is of the same nature as that on major and minor irrigation and land reclamation Actually expenditure on fertilizers manures and seeds is of a recurring character If this expenditure is not incurred annually additional annual produce will not be available The real capital expenditure on schemes of fertilizers and improved seeds would be 0 and 83 times respectively of the annual recurring expenditure.

The agency on which the Five Year Plan depend for large-scale additional produce of food grains in particular is another equally difficult dilemma There can be no two opinions that the agriculturists (small owners and / or tillers) deserve assistance but that remark must not be construed to mean that they can be depended upon to utilise economically and to the best advantage of the nation amenities like irrigation water manures and power We do not want to convey that the average cultivator will not after training become an efficient producer but that cannot happen overnight Training over decades will be necessary It is true that a few from amongst the villagers and cultivators are ambitious and pushing but they form a very insignificant percentage of the total rural population

Though the normal cultivators are not the most satisfactory agency for the purpose of efficient production it cannot be denied that they constitute the only agency in the field We hope it will be conceded however that they cannot be left alone to cultivate their land in any manner they like Some degree of control over their behaviour as producers is inevitable under any planned development particularly in the case of lands brought under canal Laying down of output target and helpless dependence upon the uncertain behaviour of cultivators cannot go together under any system of planning The recent experience of the G M F campaign would show that our fears are not entirely unfounded

It is not intended that capitalist should instead be allowed the monopoly over the use of irrigation waters manures and power and thus be allowed to exploit the poor cultivators and the general tax payer We have no desire to enter into the controversy of Capitalism *versus* Socialism and Communism but wish to record that radical change in the social and psychological set up of of this society are essential to achieve a high level of efficiency which the Plan presumes and on the basis of which the targets of produce in the Plan are likely to be achieved whether in the matter of commercial or food-grains produce by the use of irrigation waters manures and power Those psychological changes cannot in any case be expected to take place prior to 1955-56

One more dilemma has to be faced when one finds diverse arguments put forward regarding the material for construction (earth masonry or concrete) of dam and also regarding the use of foreign machinery *versus* man power known to be available in India One hears strong arguments both in favour of earthen and masonry (or concrete) dams for reservoirs under construction We shall purposely keep cases of very high dams out of account

Thus one finds a large dam like the Hirakud being constructed of earth That may be due one might infer to scarcity of or long lead of stone there But one also hears of the Gangapur Dam in Bombay being constructed in earth though the lead of stone there is small and hydraulic lime available It is understood that narrower sites with good foundations suitable for masonry dams were available there but that an earthen dam was estimated to be cheaper as

rates with earth moving machinery were expected to be low If the arguments in favour of earthen dams are sound and acceptable in the case of the Gangapur on the grounds of economy one should not find many dams with medium heights being constructed in masonry Strangely enough however one finds an important dam (with mediocre height) like the Tungabhadra being constructed of masonry It is surprising to note that whether the proposal is for constructing a dam in earthwork or of masonry it is invariably supported by strong arguments based on grounds of economy Earthen dams being generally constructed by earth moving machinery the problem of selection between an earthen dam and a masonry dam boils down to machinery *versus* man power'

Yet another dilemma pertains to cannals in South India and their long lengths Example may be quoted of the cannal from the gigantic Tungabhadra Reservoir The Hyderabad side canal is to have a length of 127 miles (exclusive of a large continuation branch at tail) while the Madras side is to have 2?5 miles! The length of the Nira Right Bank Canal was proposed (in 1917) by the Government of Bombay to be cut down from 10? to 89 miles but the Government of India insisted on its being constructed the full length with the idea of commanding (and hence of protecting) areas in the famine zone at tail The past 35 years have seen the tail portion beyond mile 70 to be virtually dry Similar conditions prevail on the Nizamsagar Canal (in Hyderabad) also The Tungabhadra Canals are in every respect comparable to the Nira Right Instead of taking a lesson from the past experience the Tungabhadra Canals are not only going to repeat but to aggravate the error

Again existing canals like the Nizamsagar have failed to carry the designed discharge Against 3400 cusecs for which it was designed the Nizamsagar canal has been able to carry a maximum of only ?000 cusecs Against 1?00 cusecs (actually 1?80 cusecs) for which the Nira Right Bank Canal was designed it could not till after recent *remodelling* carry even 1 050 cusecs safely *Even after remodelling* a certain flumed cut designed to carry 1 300 cusecs could not it has been ascertained carry more than 1 0?0 cusecs The mistake is it is understood due to incorrect designs of flumed rocky cuts and even lining of canals will not improve matters It is a pity that these warnings appear to fall on deaf ears of the engineers and administrator

While some difference in additional out turn of grain per acre irrigated by different schemes in different tracts is bound to occur depending upon the quantity of water available in storage reservoir and its timely supply we find the variation to be surprisingly unusual Unfortunately we could not get from all the States information on their schemes but the limited data available are sufficient by themselves to allow an idea to be formed Thus the Bhakra Nangal Project expect the additional grain (rice) to be 58 maunds per acre the Mahanadi Project assumes it to be 1? maunds while the Belan in U P puts the figure at only ? These differences are too large to be accepted

The figures for Madhya Pradesh leave us to wonder whether they should be called anomalous or absurd That State expects the additional out turn

of food per acre from Minor irrigation to be larger than that per acre served by Major! The wide disparity in figures (ranging from 5 for Belan to 56 for Bhakra) need no further comment

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PART 2

(1) RETURNS FROM IRRIGATION WORKS AN APPRAISAL

The Report of the Planning Commission and the D S V have furnished some data regarding the magnitude of the investment effort in the sphere of agriculture and irrigation and the returns in terms of produce expected of that investment effort It is usual to accept the statistical data supplied by authorities like the Planning Commission as reliable and correct This confidence was however under-mined owing to various reasons and we considered it highly desirable—nay essential to—examine figures of investment effort and the returns envisaged by some simple method

An attempt was considered necessary to ascertain whether the benefits of irrigation expressed in terms of money value of additional produce are consistent with the investment effort provided in the Plan This enquiry was undertaken in respect of the following irrigation schemes —

(1) Major Irrigation Schemes *i e* State Irrigation Projects and the Multi purpose Schemes
(2) Minor Irrigation Schemes
(3) All Irrigation Schemes both Major and Minor

As sufficient data about investments and returns was not available in the *Report* we had to make certain safe alternative assumptions about capital investment and about the proportion of commercial produce (Page 18–219 of the Report) expected from each of the 3 groups

The results of our enquiry expressed in terms of ratios of investment on irrigation per rupee worth of annual additional produce may conveniently be summarized as follows —

1 **Major Irrigation —**
Total investment = Rs 305 crores or alternatively Rs 380 crores
(*a*) Value of food and entire commercial produce = Rs 13 crores
Ratio of capital to rupee worth of annual additional produce = Rs 1 4 or alternatively Rs 1 8
(*b*) Value of food and 2/3rds commercial produce = Rs 171 crores
Ratio of capital to rupee worth of annual additional produce = Rs 1 8 or alternatively Rs 2 2
(*c*) Value of food and 1/3rd commercial produce = Rs 128 crores
Ratio of capital to rupee worth of annual additional produce = Rs 2 4 or alternatively Rs 3 0

2 **Minor Irrigation —**
Total investment = Rs 90 crores
(*a*) Value of food only = Rs 77 crores
Ratio of capital to rupee worth of annual additional produce = Rs 1 2

(*b*) Value of food and 1/3rd of commercial produce = Rs 119 crores. Ratio of capital to rupee worth of annual additional produce = Rs 0 8

3 **All Irrigation —**

Total investment = Rs 395 crores or alternatively Rs 470 crores

(*a*) Value of food and entire commercial produce = Rs 290 crores Ratio of capital to rupee worth of annual additional produce = Rs 1 [illegible] or alternatively Rs 1 6

(*b*) Value of food and 2/3rds commercial produce = Rs 248 crores Ratio of capital to rupee worth of annual additional produce = Rs 1 [illegible] or alternatively Rs 1 9

(*c*) Value of food and 1/3rd commercial produce = Rs [illegible] crores Ratio of capital to rupee worth of annual additional produce = Rs 1 9 or alternatively Rs 2 3

It would be worthwhile to verify and test the feasibility of these ratios in the light of our past experience with regard to the productivity of existing irrigation works for which figures are available accounts having been maintained We therefore worked out for the existing irrigation works (by the use of suitable coefficients) figures for capital per rupee worth of *additional* annual produce attributable to irrigation The relevant figures are presented in the following Table

TABLE showing

Capital per rupee worth of annual additional produce for existing irrigation works

S No	Type of work	Capital per rupee worth of annual additional produce allocable to irrigation	
		Minimum	Probable
1	2	3	4
1	Weir cum diversion canals	Rs 7	Rs 10
	Barrage cum diversion canals	15	[illegible]
3	Canals from reservoirs on dependable rivers	[illegible]	30
4	Canals from reservoirs on non-dependable streams	40	50

While comparing figures for existing canals for different provinces it was noted that the ratios are lower in the Punjab and Uttar Pradesh than in the other provinces This is so mainly because the canals in these above named provinces are largely diversion canals which do not involve heavy investment on the construction of storage reservoirs On the other hand in provinces like Bombay and Madhya Pradesh the ratios are much higher mainly because the canals there are largely fed by reservoirs which require for their construction a much larger capital expenditure It is necessary to note in this connection that a very large number of the major irrigation scheme under the Five Year Plan are reservoir schemes not only in the South but also in the North

A comparison shows that the ratios which we have derived for the new irrigation works are but a fraction of those actually found to be necessary for the existing reservoir irrigation systems

We could not persuade ourselves to accept these low ratios and have a strong suspicion that the over zealous technicians in their anxiety to make their schemes appear more respectable than they actually are have underestimated the capital requirements of and / or they have grossly over estimated the returns from the new schemes The very fact that the estimates of cost in respect of a large number of irrigation schemes are being continuously revised upwards is a sufficient indication that the capital requirements were *ab initio* unduly under estimated

The data produced is sufficient to convince any one that the investment proposed to be made on irrigation scheme is very inadequate and that the additional produce (particularly of food grains) would be only a fraction of what is envisaged in the Report

A comparison between

(1) figures of investment per rupee worth of additional produce for type 3 i e. reservoir cum canal schemes in the table a page 1? and

(?) figures of capital provided for major minor and all irrigation schemes as recorded above

clearly shows that the Report provides only about one rupee (and not more than three rupees) per rupee worth of additional produce whereas Rs 20 were required for existing major irrigation works

We have examined above the figures of investments for all irrigation works put together We shall try presently to find out whether and if so how far we can check the investments on individual schemes

(2) Examination of individual schemes in the D S V

The most suitable and dependable method for testing the sufficiency or otherwise of capital provided for a given project is by comparison with figures of capital required for similar projects actually constructed in the past Such a comparison is however made difficult as figures for capital and returns have

not been given in the D S V for many individual or lumped schemes As pointed out before many small schemes have not been printed in the D S V

Even if lumped figures of expenditure and of produce were made available separately for petty schemes falling under the broad categories viz (1) Minor irrigation works (2) land reclamation (3) fertilizers and (4) improved seed they would have been useful for analysis As such figures have not been given we found ourselves unable to correlate statewise figures of areas given in Appendices IX and X (on pages 221 and 222 of the Report) and those of produce of food by each of the four measures (given on page 217 of the Report) Any attempt at utilizing the data referred to above was made extremely difficult owing to the additional fact that the figures of commercial produce by each of the measures were not shown separately in Appendix II at pages 218 and 219 of the Report

Again the targets printed in the D S V have not been expressed in terms of uniform units like additional acreage or quantum of additional produce Since the targets have been expressed in widely different units by different States it was not possible to ascertain the adequacy or otherwise of capital per unit It was impossible to examine the schemes the targets for which were given by the states concerned in units of the following types

1 Numbers of schemes (Minor irrigation pumps etc)
2 Number of farms
3 Number of wells
4 Number of tractors purchased

Leaving apart cases of schemes the targets of which were given in units recorded above the targets adopted for the rest were also not uniform In fact in about 90 schemes under agriculture the targets have not been shown at all! It is not known why the States concerned did not or could not supply figures of targets for nearly all the schemes in the D S V list for Agriculture and particularly why the Planning Commission did not insist upon obtaining the figures in some useful units in tons or maunds or number of bales or at least area benefiting by the schemes

Comments and findings from figures where figures were available in the D S V are offered below

Several anomalies come to notice by a study of figures of schemes of minor irrigation in the D S V Unfortunately figures of produce per acre are available directly from data in the D S V in the case of 4 schemes only Even these expose anomalies as shown in the table on the next page

The figure of additional produce per irrigated acre in the case of the three schemes of Mysore would serve as a typical instance of incongruity It is noteworthy that all the three schemes come under the category of *Minor irrigation*

S No In D.S V	State	Name of Scheme	*Produce in pounds* per acre Figure work d out from data for individual schemes in the D S V Actual
1	2	8	4
4	Assam	M I Works	32
4	*Mysore*	*Desilting old Tanks*	336
5		Tank feeder and pick up chann ls	747
3		Subsidy for Wells	11?0

and belong to the same State of Mysore In the case of the scheme called Subsidy for Wells every irrigable acre is expected to provide more than three times as much additional out-turn as that expected of the scheme desilting old tanks

The anomaly does not however end with that corrigendum we still find ourselves *facing worse types of anomalies In the list of works under Agriculture* for Assam we get figures of additional produce expected by five different types of amenities shown in the Table printed on page no 16

While we *have nothing to say against mechanical cultivation as such* we were not aware that it was so effective a measure as to be able to supply annually ¼ ton of additional grain per acre of area benefited We also did not know that in Assam Improved Seeds could make as large an addition to produce per acre as the supply of irrigation facilities We did not at the sam time know that the supply of improved seeds was such a costly item Even assuming that the figure ?700 represented the tonnage of seed and not of ordinary grain *Rs 4 317 per ton of seeds is too fantastic a figure to be true Seed* ... *need more* capital per ton than food but not 10 times as much Similarly Rs 4 ?80 is a tremendously high figure whether it is per ton of manures or per ton of additional food produced annually by that manure There is obviously *something very definitely wrong with the figures*

Our curiosity was particularly aroused by the scheme of Plant Protection for Assam This scheme appears to be capable of adding annually a ton of food to Assam s granary at a paltry expense of Rs 19 ! ! Again the

(Table referred to in para 2 at pa,e 15)

Type of Amenity	Scheme No h the list for Assam	Area b nefit ing by amenity	Tons of Produce expect d corres ponding to figs in Cols (3 & ~)	Additional produce xpected per acre by the amenity		Capital required	
						Total for Scheme	Per additional ton of p oduce
	D S V	Acres		Ton	Pounds	Lakh Rupees	Rupees
1	2	3	4	5	6	7	8
Mechanised Cultivation	3	1 000	~ 500	1/2	1120	~2 5	300
Minor Irrigation	4	5 08 000	~30 000	About 1/~	320	188 9	260
Manures	5	(000	1 000	1/6	8~0	47 8	4~80
Seeds	6	~0 000	2 ~00	1/7 5	300	116 6	4317
Plant Protection	7	4 15 000	~9 000	1/5 2.	430	14 5	19

in out turn per acre due to the Plant Protection Scheme is 1½ times as much as by mino irrigation

On prima facie grounds the figures of out turn assumed p r acre and capital required per acre or per ton appear to be far from reasonable Thus the Mysore State is found to expect 14 maunds of **additional** produce per acre by prov ding sul s dy for well The same State expects to add over 0 maunds of produce per acre by Tank feed r and pick-up channels

The fi ure o capital per acre irrigable by minor irrigation schemes varies from Rs _ 1 for Bon bay to Rs ~4 per acre of flow irrigation for Madhya Pradesh The capital per ton of annual additional produce similarly varies from Rs ~0 r A s m to Rs 1 ~80 for Mysore (both figures for flow irrigation and both based on the data given in the d tailed l st of works in the D S V) In th case of well also Rs 310 per acre are needed by Madhya Bharat while Rs 1 40) p r are required by Mysore In the case of Pumps M dhya Bharat pro s Rs 40 per acre while Lep u need Rs 5 ~00 per acre We re aware that the acre is not an ideal unit for comparing capital expend ture on irrigation works unless we know that the crop pattern in all the cases was th same But even a ter keeping the above in mind we find the disparity to be too wide

We shall next consider schemes for Mechanical Cultivation and Tractors Out of th 11 schemes for which targets are given in the D S V only two schemes give figures of produce one under Mechanical Cultivation and the other under Tractors In the ca e of Mechanical Cultivation Assam gives figures both for acres benefiting and for produce That help to show that that province expects to add 11.0 lbs *i e* 14 maunds of ric (about °0 maunds of paddy) by mecha nical cultivation per acre We consider that figure to be too high Exa mining figures of capital per acre benefiting by mechanised cultivation one finds the Punjab providing Rs 70 per acre while Bombay provides Rs 313 per acre! An examination of figures for tractors reveals a very wide variation the Union Government provides about 100 Rs per acre while Vindhya Pradesh needs Rs 380 per acre while Madhya Bharat provides Rs 150 per acre Madhya Pradesh the neighbour State needs Rs 3700 per acre i e nearly °4 times ! !

In the case of C T O the total figure of acreage as given in the D S V list is 10 50 000 while that given on page °°2 of the Report is 14 16 000 ! One therefore finds himself completely confused and does not know which of the two figures should be accepted as correct !

As regards reclamation of waste lands we find that Vindhya Pradesh provides Rs 500 per acre of waste land reclaimed while Bihar considers a pro vision of Rs 39 per acre to be sufficient for the same purpose The latter is only about 8 of the former ! We are not quite sure whether it was worth while reclaiming ordinary (*i e* unirrigable) lands at a cost of Rs 500 per acre in Vindhya Pradesh

While going through the figures of cost of contour bunding etc it is noticed that 3 out of the 4 States that supply figures of cost and area for con tour bundin appear to require a sum in excess of Rs 3 0 per acre It is difficul to understand this high figure In fact U P needs Rs 470 per acre for contour bundhis Even Vindhya Pradesh needs Rs 110 per acre for con tour bunding Contour bunds in other States are known to cost only about Rs 60 per acre (including over head) even where waste weirs are provided

While studying figure for Land Reclamation our attention war parti cularly drawn to the foot note to Appendix V page 2°° of the Report We were surprised to notice that out of the 3 69 million acres to be reclaimed or developed by other means including fallows 3 million acres were to be reclaimed by only two States—° million acres by Hyderabad and 1 million acres by Madhya Pradesh In order to verify figures of Capital provided we naturally opened at page 8- of the D S V for Hyderabad but found that there was not a single scheme which provided capital required for this purpose ! We then returned to page 14 in the D S V for Madhya Pradesh to find pro vision of capital for one million acres Here too we were disappointed. The same was true of Madhya Bharat and Bihar which propose to deal with 3 70 000 acres and 80 000 acres respectively by other means

A study of the few schemes that lend themselves to verification shows very wide disparity in the provision of capital made by the different States per unit A disparity of 1 to 10 is not uncommon and that of 1 to 4 almost normal Actually we met with cases where the disparity in provision of capital per unit was even in excess of 1 to 25 We however suggest a way out to explain the serious anomaly by hinting that the figures of targets were themselves probably incorrect in many cases If such is the case we doubt the utility of the D S V it is dangerous to depend upon such figures as one cannot know which out of those may be wrong

We have noticed that no targets have been given for 79 schemes under Agriculture in the D S V We may ask a pertinent question what steps did the Planning Commission take to obtain the information needed ? Are we to suppose that the States in question refused to give figures for targets even after being requested to supply the same ? About 35 % of the schemes under Agriculture have no targets shown against them Only about 20 % of the schemes give targets in useful units We suppose that if the Planning Commission had taken the necessary pains and pressed for figures for targets for as many schemes as possible and that too in uniform and useful units (which should have been suggested by the Commission themselves) the States would certainly have supplied them The Planning Commission would then have been able to provide really useful data

(3) Major Irrigation

We have seen how the production targets fixed are out of all proportion to the investment planned The object of this Section is to examine in some detail the relation between the input of resources for increasing productive capacity and the output of goods that the Commission expect as far as the Major irrigation works are concerned

Such a close examination is however extremely difficult for the simple reason that the voluminous documents that the Commission have brought out do not provide any opportunity to do so The Report no doubt gives the figures of targets of food-grains from the Major irrigation projects in each State but we are left in the dark as regards the tonnage of food that the different individual projects could be expected to yield The figures show the total area of *mixed* crops that is going to be benefited by each individual project but there is no information about the area under different crops out of this total area It has been already pointed out that the Report does not show what portion of the additional commercial produce is expected from Major irrigation as a whole in India or from Major irrigation works in each State-not to speak of that *from each Major irrigation scheme* Nor was *this information available even* after writing letters

There was thus no alternative but to examine in some detail a few typical schemes information about which happened to be published i

technical journals All we need to record here is that these projects were chosen not because we had any pre-inclinations towards them but only because articles on those projects happened to be published in the journals in the form of technical papers

The Major irrigation reservoir schemes in the Five Year Plan may be divided into the following three categories for the purpose of our examination

I Perennial canal schemes with very large reservoirs (and with large areas of commercial crop) — This type has an unfailing and large storage reservoir with large perennial canals The Krishnaraj agar of Mysore the Nizamsagar of Hyderabad the Mettur of Madras and also the Nira Pravara and Godavari canals of Bombay fall under this category The Tungabhadra project and also the Irrigation parts of some Multi-purpose projects (pages 124-125 of the D S V) fall under this category

II Reservoirs in tracts having fairly good rainfall with canals mainly for rice and some commercial crops —Tanks and canals having rice as the main crop to be irrigated in medium to large rainfall tracts constitute this type Many tanks like the Tendula in M P fall under this category The Mayurakshi in West Bengal and the Belan in U P fall under this category so do the irrigation canals in the D V C project which have rice as the main crop

III Tanks on non perennial rivers in low rainfall areas – The Mhaswad tank in Bombay is an existing example of this type The Moj in Saurashtra and the Ranand in Bombay fall into this category

We shall take up for analysis and detailed study representative schemes from each of the 3 types

Examination of a scheme of Type I

(*Large Reservoirs with perennial canals*)

Representative Tungabhadra (Hyderabad side)

As already stated the official publication gives a figure of irrigable area of mixed crops but without the break up of that figure even by important crops We had therefore to depend upon information in an article written by an official in the P W D of the Hyderabad State appearing in the March 1953 issue of the Journal of the Institution of Engineers India Since the information was available in the said article for the Hyderabad-side canal only we are taking up that project for a detailed study

The article supplies the names of crops and also the break up of areas by crops The area expected to be irrigated by the Hyderabad canal is 9 50 000 acres as irrigable after completion Now this is more than double the area of 450 000 acres shown in the D S V This wide difference is very

surprising The only possible way to make the two figures accord would be by presuming firstly that the area of about 24 lakh acres mentioned in the said article as consisting of pastures forests and green manures are the crops that are expected to be irrigated only when water is not in demand for the other crops and secondly that the areas given in the Plan were about 2/3rd of those given in the article and that the pattern of crops shown in the technical article remained unchanged

It is proposed to test whether the water available in the reservoir and the discharging capacity provided are adequate for the requirements of the crops for the area shown as irrigable in the D S R viz 4 50 000 acres It is not intended to do this by the orthodox method of working out irrigable areas by assuming figures of duty the inch depth of water per rotation and per season etc We propose here an easy and simple method and which has *the merit of not clouding the judgement of the non technical reader with high* sounding technical terms This easy and the most practicable method is to compare the figures of areas of crops expected to be irrigated with the figures of areas irrigated on an existing comparable irrigation system The most suitable base for comparison is the Nira canal system in the State of Bombay *The annual rainfall in the commanded areas of the Nira Canals is of the same* order as that in the areas commanded by the Tungabhadra Canal Lastly the designed discharging capacity of the Tungabhadra canal on the Hyderabad side is 8150 cusecs while that of the Nira canals is about 2500 cusecs The Nira canals system is therefore the most suitable yard stick for measuring the Tungabhadra

Calculations show that Hyderabad s share in the storage of Tungabhadra Reservoir as well as the discharging capacity (particularly the latter) will both be insufficient to irrigate the 4 50 000 acres Storage is however not an insurmountable difficulty Little can however be done regarding the defective discharging capacity of the canal which is hopelessly low Even the designed capacity is not even 60 of what is likely to be required to irrigate satisfactorily all the crops But that is not all the canal will not be able to convey the 8150 cusecs as designed The actual discharging capacity (of the irriga*tion canal as designed and constructed*) will our calculations show be only about 83 of what will be required to irrigate properly the areas of crops totalling 4 50 000 acres as quoted in the D S R

Our calculations indicate that crops on 4½ lakhs of acres (as envisaged in the Plan) and with the pattern given in the published paper on the Tungabhadra (except for forests pastures and green manures) will need

(1) a storage of 65 000 m c ft against 57 000 m c ft available and

(2) a minimum discharging capacity of 6 000 cusecs (and a desirable discharging capacity of 7 600 cusecs) against 8 150 cusecs designed and about 9 000 cusecs likely to be available according to our calculations

It is true that the areas to be irrigated as envisaged by the Planning Commission are smaller than those mentioned in the technical paper referred to above That does not however mean that the figures of areas in the Plan are therefore correc and safe Calculation show that the area of food crops will be only 50 000 acres and not 2 38 000 expected out of 4½ lakh acres owing to *the capacity of the canal being insufficient This drastic reduction will no* doubt be accompanied by a substantial ncrease in the area of cane but that is no solution to the thorny problem of grain shortage The dras ic change in the pattern of crops is due to the fact that a given stora e can be utilized with an insufficient carrying capacity orly by a large increase in perennial crops like cane accompanied by a very drastic reduction in the area of seasonal (grain, cotton etc) crops We might also consider areas of crops like y to be irrigated in case the storage was raised from 56 000 to 65 000 m c ft presuming that the discharging capacity of 3 150 cusecs was available Even so the area of food crops will still fall short of 1 00 000 acres against 2 38 000 acres planned and that of cotton will be 40 000 acres against 67 000 acre planned

Unfortunately the Report as well as the technical paper referred to above have not shown anywhere the figure of out turn per acre or the total out turn expected Strong indirect evidence however shows that Hyderabad expects more than 17 maunds of grains per acre This is a very hi h figure and is possible only with a small figure of duty Our assumption of la ge discharging capacity for the Tungabhadra is therefore quite in keeping with the expectations of additional out turn

The method followed to work out the discharging capacity required by a canal wil be found explained in Part 3 This knotty problem has been studied very carefully in the Bombay State particularly on its five major irrigation systems ti Mutha Nira Pravara Godawari and Girna The method is known as the A I /D C (which is the short form of area irrigated per day cusec) method

From information available it can safely be stated that the disch rging capacity of the Tungabhadr canal on the Mysore Andhra side is far more defective than that on the Hyderabad s de For reasons similar to those qu ted *in the ca e of the anal on the Hyderabad side the discharging capacity of the* Mysore-Andhra side canal will fall short of even 1300 cusecs against 1750 cusecs designed and of about 6 000 cusecs required

Some would find it difficult to believe that the Project Engineers and Administrators who worked out and sanctioned the scheme could commit such blunders They may also feel that at least the Planning Commission would not allow such mistakes and blunders to go unnoticed We have no desire to discuss this difficult question and record an unp latable reply Time alone w ll prove or disprove our predi tion However we shall take an example from the Hyderabad State itself in view of the fact that the Tungabhadra canal discussed above was also at State

We shall take the example of the Nizamsagar *Project of which the* Hyderabad State is naturally proud That irrigation scheme was expected in the year 19?2 to irrigate annually an area of 3 ?0 000 acres and give a return of about 15 per cent Estimates were revised 8 years later the originally estimated cost of Rs 3 crores had shot up by then to Rs 4½ crores the revised return had fallen from 15 per cent to 10 8 per cent the revised figure of area expected to be irrigated being 2 7? 000 acres However even these latter figures were after all estimates Actually the area irrigated on the Nizam sagar Canal in the year 195 ?3 has been ascertained to be only 1 3? 5?? acres this is corroborated by an official publication of the Hyderabad State which states the figure of irrigated area as about 1¼ lakh acres only The *area irrigated is only about ?5 per cent of the crevised estimated figure* (revised in 1930) and only about 47 per cent of the figure of irrigable area estimated by the Chief Engineer of Hyderabad in 19 2 *The return originally* estimated at 1? per cent dwindled down to 10 8 per cent on the estimate being revised ? years later *It* is no wonder therefore that the return actually obtained on the said scheme was insufficient to pay off even the interest charges not to mention depreciation.

Not only is the area irrigated by the Nizamsagar even 25 years *after* the canal was opened(i e after full period required for gestation and development was over) only 5? per cent of what was estimated 8 years after the project was sanctioned but the out-turn of crops too is small

The defective discharging capacity of the Tungabhadra Canal will affect very *seriously the produce of food grains in particular The gener l public are* under the impression that the Five Year Plan was particularly intended to increase India s production of *food grains whereas schemes* like the Tungabhadra (as designed) will irrigate only a fraction (about ¼th to ⅓th) of the acreage of foodgrains expected of them

Generally speaking the total produce (*including grains and commercial* commodities) on the Tungabhadra Canal Hydarabad side will be less than 50 per cent of what could be expected from areas shown as irrigable in the technical paper refered to above and less than ?/3 rd of what we presume is expected by the plan As the Plan does not give figures of areas of different crops (even for projects of the magnitude of the Tungabhadra) and certainly *not of the produce of commodities we canno express ourselves more explicitly*

Examination of a scheme of Type II

(*Medium si e tanl s mainly for rice crop*)

Representative Mayurakshi

This project is taken for comparison as a technical article on that has been published in the journal of the Institution of Engineers (India) in 195? As in the c se of the Tungabhadra the Mayurakshi also grossly over estimates

its out turn of food grains The Mayurakshi Project is very defective in the discharging capacity of its canals Bengal s irrigation works in the past were weir-cum canals the most important being the old Damodar canal taking off from the Anderson Weir No yard stick from Bengal itself is therefore available We would therefore compare it with the Belan of U P for which also a technical article has been published in the Journal of the Institution of Engineers (India) The article on the Belan makes it clear that it was prepared on the basis of results obtained on the existing Ghaghar canals in the U P

The Mayurakshi expects to irrigate 7 20 000 acres while the Belan expects to irrigate 3) 000 acres The length of the Mayurakshi Canal is 140 miles while that of the Belan is only 29 miles It will thus be seen that the Belan is a much smaller scheme as compared to the Mayurakshi The Mayurakshi is expected to irrigate 18 times as much area as the Belan Obviously therefore the percentage losses (of water) in transit in the Mayurakshi are bound to be much larger than those in the Belan This in other words requires that the figure of duty for discharging capacity of the canal in the case of Mayurakshi should be smaller than that of the Belan Published data however show that the duty adopted for designing the canal for the Mayurakshi is actually in excess of that adopted in the design for the Belan

Not only does the Mayurakshi provide a much smaller discharging capacity (for equal areas of crops) but also expects a much larger *additional* out turn per acre irrigated While the Belan expects only 5 maunds of grains per acre the Mayurakshi expect two and a half times that figure which the technical paper states in unequivocal terms is the *additional* yield Obviously it is the case of a two fold mistake defective discharging capacity and unjustifiably high yields

Information collected shows that most of the schemes in the Five Year Plan under this category are also designed with high duties and yet the additional yield expected is about 3 and in some cases 4 times of what could reasonably be expected with the high figures of duty adopted for discharging capacity of canals etc Broadly speaking therefore the projects which fall into this category can be expected to yield only about 25 per cent and at the most 33 per cent of the additional output of grains expected by the Commission

We have stated that we could not obtain from most State Governments data about different crops expected on the individual major irrigation schemes in the Five Year Plan After very strenuous efforts we could obtain information on the break up by crops in one State These figures however only helped to aggravate our doubts and fears We found that Projects to irrigate 70 per cent of lands proposed to be irrigated by works listed as State Irrigation Projects for one State during the period of the plan were still in the embryo and yet the Plan expects ~ quantities of produce from them to be available

by 1955–56 There was yet another surprise in store Going by the data supplied to us we were surprised to find that the irrigable crops under the State Irrigation Projects for that State do not include a single acre of crop to produce the commercial commodities to be produced by the State

Regarding canals in one important Multi purpose project (with rice as the main crop) the officers concerned were frank enough to openly admit that the crop pattern for that scheme was not yet decided upon though detailed plans and estimates were drawn up and although the canals were constructed or being constructed[1] We began to suspect from the refusal on the part of most State to supply figures of break up of crops and of produce etc whether works of major irrigation projects (listed in the D S V) were being constructed by them also without any pattern of crops or of produce being fixed in advance

Examination of a scheme of Type III

Reservoir schemes in low rainfall tracts

Representative Schemes Moj in Saurashtra and Ranand in Bombay

The Moj has at the site of the dam a catchment of 170 sq miles The designed storage is 1 310 m c ft the area to be irrigated being 15 000 acres This works out at about 12 acres expected to be irrigated per m c ft of storage In similar tracts provided with similar types of reservoirs in the eastern parts of Maharashtra the area irrigated per m c ft of designed storage (average for about 20 years) was only 3 8 acres Obviously therefore the area expected to be irrigated by the Moj is pitched far too high being more than 3 times of what could reasonably be expected by comparison with similarly situated existing works of comparable magnitude and with comparable environment

Another example of this category is that of the Ranand in the Bombay State The designed storage capacity of the Ranand above the sill level of outlet is 2 5 m c ft and the area expected to be irrigated is 3 000 acres This works out at 13 acres per m c ft as against only 3 8 acres per m c ft the actual average over 20 years for similar irrigation schemes in Bombay The area assumed to be irrigated per m c ft of designed storage is therefore more than 3 times of what has been actually obtained in practice in the past and at least twice of what could be expected on optimistic assumptions It may particularly be recorded that the area (average for 20 years) irrigated by the Mhaswad tank system (situated very close to Ranand) was only about 4 acres per m c ft of designed storage capacity

There is still another very important defect in the Ranand Reservoir Scheme The catchment area of the Ranand is a part of the catchment of the existing Mhaswad tank Obviously what will be stored in the Ranand will represent a loss—at least partly—to Mhaswad as this latter is found not to fill for 4 years out of 10 when demand for water for food grain crops is

keen We should not therefore expect any substantial net addition to the acreage irrigated as well as to the additional output of food by the construction of the Ranand

Whichever type of irrigation schemes is taken up for examination one would come to the irresistible conclusion that the areas to be irrigated and consequently the net addition to the output have both been over estimated This conclusion is further buttressed by the scrutiny of figures of duty adopted on these irrigation schemes Our study exhibits a uniform and significant trend toward serious over–estimation of areas and output particularly of food grains

(4) Minor Irrigation

We have examined typical Major irrigation works and have also commented upon certain important defects It has been shown that the additional output *of food–grains in particular was glossly over estimated We would now* examine Minor Irrigation works included in the Plan

As has been repeatedly stated before the Report does not give the break-up of figures of targets of commercial produce for each State and for each of the four measures *viz* major irrigation minor irrigation land reclamation and improved seeds Figures of such break up have been furnished only for food grains It is true that the Report shows separate State wise figures of acres to be irrigated by Major and Minor irrigation unfortunately however such figures are for mixed (food and commercial) crops

Minor irrigation works are generally speaking expected to produce mainly food grains It would be therefore in order to expect that figures of out turn obtained by dividing figures of produce of food by that of area irrigable by minor irrigation works for different States with comparable conditions of rain fall should not differ widely though there may be one or two exceptional cases Such figures represent the minimum out turn per acre expected by the State for all its Minor Irrigation works

It is however surprising that the figures differ rather widely particularly in tracts with medium and low rainfall Considering the States with medium rainfall we find that Hyderabad expects a minimum of 1 330 lbs of *additional* produce per acre due to minor irrigation and Madras also expects a minimum of about 1 150 lbs U P and Mysore on the other hand appear to place their minimum expectations of additional out turn at a figure of about 450 lbs which is just about one third of what Hyderabad hopes to secure The expectations of the Hyderabad and Madras States are obviously extravagant They are 3 to 4 times of what could reasonably be expected

Considering cases of States with low rainfall Ajmer expect an *additional* output of 1 500 lbs or 19 maunds per acre and thus outbids Hyderabad and Madras Rajasthan and the Punjab in the same group expect less than 300 lbs

worth of additional produce On examination of figures for individual Stat is found that Orissa provides only Rs 80 and Hyderabad less than Rs 10 ton of annual additional produce Provision made by M P is not so while that made by M B and Travancore Cochin appears to be fairly re able Bombay and Mysore do not appear to provide sufficiently for the pu In the case of the remaining State the investment provided is cert inadequate

The above is equally well reflected in the figures of capital per r worth of additional produce Here again the only States which make a provision of capital are Madhya Bharat and Travancore Cochin Bom M P U I and Mysore provide Rs to Rs 3 per rupee worth of an additional produce Bihar Madras Punjab West Bengal Pepsu Saura and Part C States invest only about one rupee to obtain a rupee wort additional output Assam Orissa Hyderabad and Rajasthan invest very m capital—only a fraction of a rupee per rupee worth of annual additional pro Provision made by India as a whole works out at an investment of one r per rupee worth of annual additional produce and this is just a fractio what would actually be required to attain the target

Judging by the available data which was supplemented by such enqu as were possible we have been led to the inevitable conclusion that out c area of 8 ?7 million acres expected to be served by minor irrigation less 40 per cent is likely to be irrigated and in any case that out of the addit out turn of 1 78 million tons of food grains expected from minor irrig we are likely to secure less than 0 50 million tons

While calculating the returns in terms of produce from minor irrig works we ought to take into account one important fact viz the short li such works If the past tendencies could be projected into the the imme future not a few would regard this capital outlay as a waste

(5) Land Reclamation Fertilizers and Improved Seeds

The Report of the Planning Commission provides separate figures of (in acres) for the following schemes —

		(in 1000 acres)
(1)	Central Tractor Organization	1 416 0
(2)	State Tractor Organization	1 199 1
(3)	Private Parties with State help	1 076 6
(4)	Other means including fallows	3 089 6
	Total	7 381 3

In additional to these some more areas are also to be reclaimed by following measures —

(a)	Bunding drainage etc	3032 9
(b)	Mechanical cultivation	34 ? 8

Scrutinizing figures for C T O one finds provision for capital outlay of Rs 508 lakhs made by Madhya Pradesh and Utter Pradesh for C T O There is nothing to indic te whether these 508 lakhs of rupees were part of the capital expenditure of Rs 1 480 lakhs by the Central Government (item 80 page 0 of the D S V) or is in addition to the investment of the Central Government The possiblity of double counting of costs and areas cannot be ruled out altogether In Madhya Bharat Vindhya Pradesh and Bhopal also considerable areas are going to be reclaimed by tractor of the Central Tractor Organization but these C T O schemes are not mentioned in the D S V lists for these States

The costs per acre of land reclaimed by tractors have been given below for some of the States It is indeed intriguing why the costs should differ so markedly from one State to another

Name of State	Cost per acre reclaimed by tractors
1	2
1 Central Government	Rs 139 or Rs 103 depending on whether 10 5 lakh acres (pages 20–21 of D S V) or 14 16 lakh acres (page 222 of Report) was the correct figure
2 Bihar	Rs 98
3 Madhya Pradesh	Rs 3 700 for C T O tractors Rs 113 for for Machine Tractor Station
4 Madhya Bharat	Rs 156 for Reclamation by tractors Rs 167 for Departmental tractors
5 Vindhya Pradesh	R 380

We shall next consider whether the volume on Development Schemes contains the necessary information giving the names of schemes their estimated costs and the targets fixed in the case of those States at least which have large areas to be reclaimed by various measures as shown in the Report.

In the case of the following States large areas are shown in the Report to be reclaimed by State tractor orgaingation and by mechanical cultivation but there is no mention of a single scheme in the detailed lists in the D S V which is likely to reclaim those areas

the said Appendix V of the Report In the Punjab a scheme fo the consolidation of holdings is expected to consolidate an area of 100 lakh acres by 1955 56 This area also finds no mention in column 5 of Appendix V at page 292 of the Report

It is necessary to remember in this connection that the actual sown area of the Punjab is about 13 million acres only It will thus be seen that the State aspires to consolidate holdings over an area of 10 million acre out of the total sown area of 13 million acres by 1955 56 Considering the slow progress of consolidation of holdings in our country during the last thirty years this rate appears to be rather phenomenal! It is also interesting to note that these 10 million acres would be consolidated during the period of the Plan at a cost of Rs 41 lakhs out of the total contemplated investment of Rs 161 lakhs This means that the balance of Rs 120 lakhs would be spent afte 1955 56 to consolidate the remaining area of only 3 million acres The cost of consolidation during the Plan period amounts to Annas 4 per acre while that after 1955 56 would amount to Rs 4 per acre The Punjab State and the Planning Commission alone know why the cost of consolidation per acre should suddenly jump up after 1955 56! The achievements of Pepsu are even more spectacular The net sown area of that state is estimated at 48 lakh acres The total area to be consolidated in the State by 1955 56 is also 48 lakh acres This means that this reform is going to be carried out over the entire sown area in the state!

Ratios of capital per ton for the combined figures of additional produce from the four measures viz Minor Irrigation land improvement Fertilizers and improved seed were purposely worked out as that reduces the number of assumptions to be made to a very minimum Even the e figures exibit wide differences as shown by the figures for the following States —

	Name of State	Capital (in rupees) per ton of annual additional produce Minimum	Probable Maximum
1	Orissa		50
2	Hyderabad		60
3	Madhya Pradesh	570	
4	Madhya Bharat	570	
5	Mysore	540	
6	Saurashtra	740	

The several instances (quoted above) of very wide differences in the provision of capital per ton of produce in the different States tend to show that apparently at least the Planning Commission concentrated their attention on merely collecting the figures from the State without undertaking any effective scrutiny of these figures to ascertain their reliability o feasibility

PART 3

(1) Adequacy of Capital for Irrigation Works A Test

The usual method of estimating the capital expenditure on a given irrigation project and the returns from it is to carry out detailed surveys to prepare plans and to work out detailed estimates of costs This is a highly technical laborious and slow but an unavoidable process for normal administration The following is a list of the main types of errors found in a large majority of irrigation projects

A
- (1) Insufficient storage per acre expected to be irrigated
- (2) Storage capacity provided (and on which average irrigable areas are based) being not available in year of sub normal rainfall
- (3) Insufficient discharging capacity of the main canal distributories and outlets etc
- (4) Insufficient provision for losses in transit

B
- (5) Too large a figure assumed as out turn per acre irrigated
- (6) Total out turn per acre assumed (by oversight) as additional out turn
- (7) Additional out turn (difference between an irrigated and unirrigated crop) available in years of poor rainfall assumed as additional available every year
- (8) Additional out turn per acre by both irrigation and manures presumed to be available owing to irrigation only that available by the use of manures being thus counted twice
- (9) Additional out turn possible in the case of a few capable cultivators assumed as available from all cultivator

C
- (10) Underestimation of expenditure by providing insufficient rates for items of work

Any attempt by an individual to scrutinize projects with a view to verification of each of the 10 points above (or of *A* *B* and *C*) is impossible particularly when little published data are available for guidance Some rough but dependable method (rule of the thumb type) for verification is therefore essential if serious over-estimation of returns or underestimation of expenditure is to be avoided

Such a rough but dependable and easy check is possible by comparing figures of capital and of returns expected from proposed works with those of irrigation projects in actual existence and that too in terms of ratio of the value of additional produce per unit of capital invested

If the results of existing works are to be a guide for testing the sufficiency of capital expenditure on the new works in the Five Year Plan it is essential to work out figures of capital and of value of produce both for the same conditions of labour rates etc The booked capital of existing works must be

converted to suit rates prevalent during the period for which data of produce are available

Having obtained the figure of Capital per rupee worth of *additional* annual produce we have to further modify the same so as to obtain a figure for Capital per rupee worth of additional produce attributable to irrigation only as distinguished from additional produce attributable to irrigation and manures Figures thus worked out show that capital per rupee worth of additional produce (both in terms of the same period) on irrigation canals depends to a large extent upon the pattern of irrigation work and this is as it should be Capital required per rupee worth of *additional produce (from both irrigation and manures) was found to be as under (figures* are rounded off purposely) —

		Rupees
(1)	Weir cum diversion canals (in the flat tracts) from large rivers	5/-
(2)	*Barrage cum diversion canals from large rivers*	10/-
(3)	Major reservoir cum canals (on perennial streams)	15 to 20
(4)	Minor reservoir cum canals (on non perennial streams)	25 to 30

A very large number of major irrigation schemes in the Five Year Plan fall under category 3 and some under category 4

The above statement gives ratios (capital per rupee worth of additional annual produce) for irrigation works in existence in India in the first half of this century Working out of these figures was rendered somewhat easy because authentic figures were available for the year 1934 in the Report of the Irrigation Enquiry Committee Bombay (1938) While there might be difference of opinion on minor points the figures of capital expenditure per rupee worth of annual produce shown in the Table at page 12 in part 2 will provide a very useful check without the danger of the main issue being distorted by the 9 defects listed above or by serious underestimation of capital expenditure

Data available do not permit State wise verification for Major Irrigation Works Figures for a few works for which data were available or could be secured have been worked out and shown below —

Name of the scheme	Capital in Rupees Per rupee worth of annual produce Provided	Minimum essential
Tungabhadra	4 3	20
Belan	4 0	20
Mayurakshi	3 7	20
Tapi (Weir scheme)	2 4	6
Major irrigation schemes in a certain state	1 4	15
do do	2 9	40

It will be found that the provision of capital is very meagre The practical interpretation of this is that the produce actually available will be only a small fraction of what has been envisaged in the Report

(7) Duty of water and Out turn by Irrigation and Manures Correlation between duty, additional out turn due to irrigation and limitations on the use of manures

A good deal of misunderstanding appears to prevail even amongst Irrigation Engineers about the correct value of Duty to be adopted The term ' Duty is used in two markedly different branches of designs of reservoir cum canals system of irrigation (1) Duty for the purpose of storage in a reservoir and ( ) Duty for the purpose of discharging capacity of a canal

Ds, i e the number of acres that can be irrigated per m c ft of storage will vary for a given crop with the local utilizable rainfall in a season on the field The larger the inch depth of such utilizable rainfall the larger the number of acres irrigable per m c ft of storage for a given crop

Dc i e the figure of acres expected to be irrigated per cusec of discharging capacity does not on the contrary depend upon and vary appreciably with the local rainfall as the capacity of the channel has to be sufficiently large to discharge all the quantity of water needed during the months when the rainfall is nil or negligible As our aim is to produce large quantities of additional produce the capacity of the canal must be sufficient i e Dc must be small enough to supply the full requirements of crops during periods when the rains fail

It may be recorded that proper understanding is necessary about the quantity of storage in a reservoir and the discharging capacity of a canal required by a crop for (a) mere protection against draught (b) limited additional produce obtainable with limited resources and limited care of crop and (c) considerably increased produce possible with timely agricultural operations like weeding and with timely and sufficient supply of manures

Just as quite a large variation is found to exist in the amount of food consumed by human beings a similar large variation is also noticed in the values of Ds and Dc It cannot be said that whatever the type and quantity of food taken the strength remains unaffected It is true that a man fed on only 6 ounces of rice does live but it would be wrong to expect him to have the strength of a sturdy soldier

The correct figures of average yield from an acre of crop is the average of yield of about 10 years some of which may have excessive some normal some poor and some very poor rainfall In 3 years out of 10 the rainfall may be very good in [illegible] year it may be bad in 1 year it may be very bad while in the remaing 4 years it may be called average i e it may not be called too bad or too good

If provided with fairly satisfactory irrigation an average cultivator can add maunds per acre to his normal crop of rice Doses of manures sufficiently large in quantity to yield large scale additional produce would be possible only when irrigation in full doses and whenever required is assured even during the worst years If chemical manures are given to paddy and if the supply of irrigation water is insufficient in a year when rains fail the crop suffers seriously and the out turn is smaller than what is available on unirrigated fields Thus not only is the expenditure on the purchase of manures and labour on its application wasted but what little out turn would otherwise have been available is also lost in case the supply of water from a canal fails during periods when the rains fail In shor the use of heavy doses of manures is practicable and advisable only when full quantity of water needed by the crop is assured

It should also be remembered that record crops obtained by a handful of individuals is no guide to what can be expected of normal cultivators on normal fields The additional out turn per a re known to be produced by such influen tial individual cultivators is therefore no guide to what could be fairly expected on the remaining fields by normal cultivators

If the number of waterings given to paddy is 3 per month at intervals of 10 days the quantity of water needed on the field for each acre of paddy in a month of no rainfall is 30 000 c ft In the case of the worst year the storage tank must provide 60 000 c ft of water on a field per a re of crop

Actually the storage corresponding to these quantities is 60 000 c ft on field per a re of paddy crop has to be 80 000 in the case of petty schemes and 200 000 c ft per acre of paddy crop in the ca e of very large schemes These quantitie of water if available will be able to add about 3 maunds per acr Again only about half the quantity can be attributed as resulting from irrigation the rest being due to manures

The normal yield per acre of rice (average for the State) as ascertained by random sampling method system varies from 7 maunds per acre in U P to 12 in Madras No dire t data for additional out turn per acre for an irrigated crop of rice over that of an unirrigated crop are available We may be right in expecting a total of 5 maunds of additional rice grain per acre if storage and carrying capacity are good only 3 maunds out of the e could be allocated to irrigat on and 2 maunds to manures It will be interesting to compare these figures with the additional grain (rice) per acre expected as a result of irrigation in the Five Year Plan

Minor Irrigation Works

Bombay	(New works)	8 maunds
	(Repairs to old works)	5

Major Irrigation Works

Bhakra (Punjab)	56 maunds	
Hirakund (Orissa)	18	(Rabi)
Mayurakshi (Bengal)	1	
Belan (U P)	5	
Madhya Pradesh	5	
Saurashtra	17	

It is obvious that the expectation of the Governments concerned in the case of the major irrigation projects viz Hirakud Mayurakshi and projects in Saurashtra are excessive But the expectations of Bhakra of obtaining 56 maunds of *additional* rice (grain) per acre beats all the other States

The two important reasons why the figures of estimated additional out-turn per acre of so many States (even excluding Bhakra) are so unduly high appear to be that they have either taken the produce provided by a few ambitious and capable cultivators (Krishi Pandits) as possible in the case of all the cultivators and / or that they have taken the figures of total produce per acre as additional produce It is also possible that they have attributed the extra produce due jointly to manures and irrigation to irrigation only

We have considered so far the question of additional produce of irrigated rice It would be worth while scrutinizing designs of irrigation tanks with jowar as an irrigated crop catered by minor or major irrigation tanks in low rainfall tracts It is usual in such designs to calculate the figure of area irrigable per m c ft of designed s or go at anything between 12 to 15 acres inclusive of losses by evaporation and still assume that manures would be applied with the expectation of increasing the yield per acre of irrigated crop by 8 maunds or more These high expectations can never be realized in practice

Jowar the most commonly irrigated millet crop in low rainfall tracts needs about 1 watering every month if no rain is available i e in a year of no rainfall 2 waterings have to be supplied to it from the tank in a year of average rainfall This is equivalent to 20 000 c ft of water on field per acre of jowar It is well known that losses in transit in such tracts are very high and concentration of irrigation low The quantity of water required per acre at the head of a canal to allow 20 000 c ft per acre on the field is about 50 000 in a small scheme and about 66 000 c ft in a medium sized scheme owing to low concentration of irrigation The latter is equivalent to 15 acre per m c ft in an average year Data collected over a period of 20 continuous years however show that the average figure of irrigated area is of the order of only 4 acres per m c ft It can be shown that only 4 to 6 acres per m c ft of designed capacity could be the actual average area irrigated over a period of 10 years if 15 acres per m c ft could be irrigated in a year of average rainfall

Regarding incorrect designs of channels due to De the effect is very serious in the case of large schemes (major irrigation). The result is that even if water is available in the storage the channel is not able to convey the full quantity needed to the fields at the time when it is in urgent demand i e [illegible] during periods when the rains fail. It is worth noting that there is a correlation between

(a) De or the inch depth of water that could be guaranteed on a field in the worst rotation even when the storage required is available

(b) the extent to which the use of manures (particularly of chemical manures like ammonium sulphate) is possible

and (c) the additional out turn of grains per acre and the portion out of that attributable separately to (1) irrigation and (2) manures

No statistical data about additional yields from areas irrigated by canals appear to have been collected. An attempt has been made in the following table to represent the probable correlation for the crop of paddy.

Nature of supply of irrigation water during periods of failure of rains	Corresponding inch depth on field per watering at 10 day intervals	Corresponding duty for purposes of discharging capacity at canal head (i e De) — Acres per cusec — Size of canal			Approximate figure of additional grain allocable to		Total additional out turn of rice
	Inches	Small	Medium	Large	Irrigation — Pounds per acre	Manures — Pounds per acre	Maunds per acre
1	2	3	4	5	6	7	8
Liberal	4	40	30	24	3 0	600	12
Good	3	43	36	30	300	500	10
Fairly Good	2½	48	40	34	2 0	400	8
Not good	2	60	48	40	1 5	250	5
Insufficient	1½	80	60	48	1 5	150	3½
Very inadequate	1	120	87	70	100	100	2½

It will be seen from the above table that a total additional produce of 12 maunds of rice per acre is possible only if the De is such as could provide

4 waterings on the field every 10 days With 8 waterings only about 10 maunds extra should be possible the duty (Dc) corresponding to that must be 30 for large canal systems like the Mayurakshi 30 for medium sized canals like the Belan and about 43 for small canals No sane cultivator will dare use chemical manures if there is no guarantee of obtaining the full dose of water during periods of insufficient rainfall

A study of figures of rainfall at Bardwan Drug and Tanjore will show that the occasions when rains fail for one month are many but there are also many cases when rains were negligibly small for 2 continuous months In fact rain was very meagre for 3 continuous months in certain cases This shows that if cultivators are to be expected to use chemical manures not only must the quantity stored be sufficient but the carrying capacity must also be high The following table shows figures of duty with which channels of certain important canals were designed and those with which they should have been designed to allow the additional quantities of grain expected per acre to be produced

Name of irrigation system	Duty provided for carrying capacity (Dc)		Additional out turn of grains expected in the design attributable to irrigation	Dc desirable at Canal head if the out turn expected in the project is to be realised from every field
	At distributary head	At Canal head	Maunds per acre	
1	2	3	4	5
Damodar Durgapur				
Left Bank canal		90	8 to 12	30
Right Bank canal		90 (140?)		
Hirakund	100	80	13	25
Mayurakshi		86	12	30
Belan			5	35

(3) Additional Produce by Irrigation and Manures Limitations in the case of Normal Cultivators

The Planning Commission believe that what is needed for large scale production is a programme of public investment which will give to the cultivator the water the power the seeds and the manures he needs so that he will do the needful and supply the targeted additional produce These results are not however likely to accrue so long as we depend upon the existing individualistic and chaotic system of agriculture

The commission appear to have lost sight of the necessity of vast changes necessary in the socio economic outlook and it is obvious that the additional production expected cannot be available for several years after the

construction of irrigation schemes The Planners on the other hand expect large quantities of produce to be available almost immediately after the construction and in some cases even prior to the completion of irrigation works

The industrialists on the other hand have a definitely commercial bias They are no doubt efficient but have a predominantly profiteering motive and go in for money crops only Had these industrialists been successful in manufacturing the product after processing of these money crops so as to sell the same at economic rates it would have been possible to export it but from the trend of prices of such processed produce like sugar it is found that the rates are high and exports are therefore not an easy matter

In short the real trouble is that out of the two agencies which are available the normal cultivator is wanting in incentive and has disadvantages like small holdings want of capital etc while the industrialist has mainly a profiteering motive Political and social influence can no doubt be brought to bear upon both and they can be made to work so as to produce what the country needs That however will need time—decades of year Spectacular results cannot thefore be obtained within a short period of five or ten years

The observance of other agricultural operations is in the case of a majority of cultivators of land in India either wanting or only half hearted It is often said that In India agriculture is not a bussiness it is only a past time Officers of Agricultural Department of a certain state have reported after collecting actual statistical data that only a small part of the additional produce possible by adopting improved system of agriculture is available with the normal cultivator as the agency Not infrequently therefore one hears of cases of ordinary cultivators having incurred a loss by using manures What is most important from the point of view of the Plan is that only a small fraction of the sumptuous additional produce expected to fill the granaries of the country is likely to be available by 1956

The rate at which ammonium sulphate was being sold at District towns was ascertained to be about Rs 430 per ton One ton of ammonium sulphate is capable it has been ascertained of producing 1 3 tons of rice grain if used methodically The out turn will however be smaller say only a little over 1 1 tons of grain in the case of an average cultivator in the absence of other operations done properly and in the absence of timely and assured supply of irrigation and generally speaking in the absence of incentive The 1 1 tons of rice thus produced may fetch about Rs 480 or so Deducting expenses the normal cultivator stands to gain a profit of Rs 20 per ton of manure if used after taking into consideration expenditure on carting and labour

The average cultivator with the lands under the command of canals does not strive towards intensive production but is satisfied by having about 20% extra over his land by making use of irrigation water from large duty canals so as to satisfy requirement of his own family and of the labour employed by him In fact it is reported that irrigation allows him to be careless regarding bunds

around his rice fields and other agricultural operations It is true that a small number of enthusiastic and capable cultivators in irrigated tracts do desire to have a more copious and timely supply of irrigation water (low duty canals) so as to produce more But the number of such cultivators is small No general conclusion must therefore be drawn from the out turn available on their farms

Assuming the normal yield of rice from unirrigated lands to be of the order of 10 maunds it will be reasonable to expect in the case of rice producing tract an additional out turn as a result of irrigation and manures as shown in the following Table

Duty for carrying capacity	Additional produce of rice per acre cultivated by								
	Ordinary cultivators			Cultivators with incentive and menas			Average for all cultivators		
	To be attributed to			To be attributed to					
	Irrigation only	Manures only	Total	Irrigation only	Manures only	Total	Irrigation only	Manure only	Total
	Maunds	Maunds	Maunds	Maunds	Maunds	Maunds	Maunds	Maunds	Maunds
Low	2½	2½	5	5	5	10	2 6	2 6	5 2
Medium	1½	1¾	3¼	3	3	6	1 8	1 9	3 7
High	1	1	2	1½	1½	3	1 0	1 0	2 0

Figures for many states in the five year plan show that they expect an addition of 6 to 12 maunds of grain per acre by irrigation Even the figures for some states which show smaller additional produce per acre are on the larger side particularly when it is borne in mind that the additional resulting from manures has been calculated separately under manures

(4) Discharging Capacity required by canals A I / D C Method

The term A I /D C is a short form of area irrigated per day cusec It needs to be repeated that it is not enough to have ample storage in the reservoir It is also equally essential to have a certain minimum discharging capacity to allow water from the reservoir to be conveyed to the fields through the main canal the distributory the outlet and the field channel etc

Duty for discharging capacity can be expressed by the following equation

Dc = (A I / D C) interval of time permissible between two consecutive waterings

Thus considering the crop of paddy and assuming that we were designing for an inch depth of 3 at each watering the following would be the typical figures of A I / D C for a command of mediocre size

At Field	8
At Distributory Head	4 5
At Canal Head	3 0

If 10 days are found to be the suitable and permissible interval between two consecutive waterings (during periods when the rains fail) the duty at the three points mentioned above will be as under

	Duty (Dc)
At Field	8 × 10 = 80
At Distributory Head	4 5 × 10 = 45
At Canal Head	3 × 10 = 30

It is worth remembering that a cusec day is equal to about 24 acre inches

Depending upon the interval at which different crops require such 3 depth waterings the Dc will vary as the A I / D C at any given point Depending upon the sufficiency or otherwise of discharging capacity a canal may fall under one of the following categories

Category Number	Discharging capacity	Dc assumed in design	Nature of utility of a canal
1	Very insufficient	High	Mere protection
2	Insufficient	Mediocre	Limited increase in production
3	Sufficient	Low	Considerable increase in production permitting the use of bulky and limited dosage of chemical manures
4	Abundant	Very small	Very large increase in production with large scale use of chemical and of bulky manures

In designs where there is only one main crop to be catered for by a canal the calculations for discharging capacity are very simple Few canals have only one crop

In major irrigation canals like the Nira and the Tungabhadra there is a large variety of crops each with it own peculiarities The types of main crops may be 10 to 20 Calculations in such cases are made for each season and for

t period in the season when peak loads are expected to occur The figure of I /D C at the head of a canal has to be assumed depending upon many tors the most important being the extent of area under command and concentration of irrigation Figures obtained on a similar existing canal therefore the best guide

Calculations by the A I / D C method for the Nira Canals show that an I / D C equal to 3 and a maximum of 3 5 is suitable for that system The U C (area under command) of the Hyderabad side of the Tungabhadra ial is nearly twice that of the Nira Canals system As such A I / D C ained will be much smaller But even assuming the same figures as for Nira culations show that the Tungabhadra (Hyderabad) should have a discharging acity of 6000 cusecs as a minim im and one of 7000 cu ecs as desirable e designed capacity of 31 0 cusecs only may be compared with that ure The fact that the channel may not actually be able to carry more than 00 cusecs (though designed for 3 150) should be noted in this context It is doubt possible to run the administration with 3150 cusecs so as to afford otection But large production is our goal and 6 000 cusecs are essential

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PART 4

(1) Distribution of Irrigation Benefits

The construction of the various irrigation schemes included in the plan expected to result in the provision of irrigation facilities to the agriculturists those parts of the country where those schemes are located The indirect enefits in the form of a larger output and trade greater employment pportunities a larger flow of income to the public exchequer etc are similarly xpected to be shared in common by the rest of the community But the extent o which these benefits are secured would depend upon a host of onsiderations including the optimum use of irrigation facilities the crop patterns dopted and implemented the adequancy of water rates and betterment harges etc

It is often sa d that sin e the irrigation facilities are created as a result of public investm nt it is only fair that thes facilit es are distributed equitably amongst the cultivator in th commanded areas We would like to indic te in this connection c rt un g ner l co si d rations tl at are suggested by the working of the exi ting reservoir irrigation y tems in the country In the Punjab and the alluvial tracts of Uttar Pradesh the favourable topographic lay out enables the canals to command a ery large p r ion of the country through which they pass Th ben fit of irrigation wat r are th refore more widely disributed geographically Secondly by virtu f the fact that most of the large irrigation works in the North and also in Madras (with the ex eption of the one which has a reservoir) have so far been of th ir type on large rivers the major part of the supply of irri ati n ater is avail ble for season l crops The supply of

ptable though it may appear to many that our agricultural indu try is in the hands of ignorant and not very enterprising agriculturists

(3) Epilogue

is expected that a large number of irrigation schemes now under tion would be completed by the end of 1955-56 That the Multi purpose would require a good few years for their completion is quite evident from of balance of expenditure after 1955-56 and the progress Reports u not be surprised if work on a large number of other irrigation schemes igers on for some years after 1955 56 Be that as it may one thing appears the various governments in the country are now busy drawing up gation projects for the second Five year Plan We would like to indicate connection a few general considerations

is discovered that in the acceptance of scheme of development for inclu i the plan political and regional considerations play quite an important Apart from the competition among the states for he acceptance of their there is often a keen rivalry betwe n the various linguistic regions same state each trying to push on its own schemes and raid the and Central Treasuries to the detrement of other states. Regions in i public opinion is sufficientley vocal succeed in taking away a bigger slice public investments In this struggle the vested interests and their hirelings an important part Projects which would not ordinarily stand the test of are advertized as the best schemes in the world It is necessary and that the final dicision in regard to the choice of the schemes are left Planning Commission

In conclusion we would like to invite attention to one more consideration me wider significance and importance It is eminently necessary that the c of schemes is made to depend also upon availability of resources and the of economic development of the country It is trite to say that India is f the poorest countries on the globe and that the living standards of her e are miserably low It is also generally conceded that we cannot afford ire economic progress to be solely determined by private enterprise and markets Planning of economic growth is inevitable and it has come to stay planning the economic growth of a country it is essential to select iques of production whi h are appropriate to that country Though natural resources are large and varied they are not copious relatively ie size of our popu ation The only productive resource which we possess indance is unskilled labour Our capital resources on which productivity of and labour depends are extremely limited In countries like the United of America the United Kingdom etc where labour is scarce and capital ely more abund int it is customary to adopt a technique which is more -using and therefore more productive It is not suggested that it would be possible at all to adopt superior techniques even in our own country What isized here is that the cost of economic development in terms of human

in the Plan would be made by the public This means in other words that the productive efficiency of public investment would be largely determined by the behaviour of independent cultivators If the decisions of the cultivators are to be determined by what is described as the impersonal arbitrament of markets there is then every danger of the crop pattern laid down in the Plan being distorted

The Commission expect additional food output of the order of 1 1 million tons from major and minor irrigation works 1 0 million tons from land reclamation and development 1 1 million tons from fertilizers and manures and 0 6 million tons from improved seeds The Commission have allowed 5 00 000 tons to be deducted from the gross target on account of possible diversion to commercial crops This incidentally shows that the Commission themselves are not quite certain about their own calculations Is there any guarantee that the diversion to commercial crops would in fact be limited to 5 00 000 tons only ? If past experience is any guide it tends to show that with the introduction of irrigation facilities provision of fertilizers and manures the tendency to grow more of commercial crops is strengthened and farming for home consumption is replaced by farming for markets The Government of Bombay had made efforts during the War and early post war period to divert irrigated lands on the Deccan Canals from commercial to food crops but found that those efforts were defeated at every stage particularly by substantial cultivators We very much doubt the efficiency of government regulations to so condition the movements of agricultural prices that a pre determined pattern of crops is realized in practice

In the case of major irrigation works in particular it would be necessary to lay down a pattern of crops Here the rule of one crop one channel may perhaps be found more convenient and practicable for the realization of a given crop pattern This would naturally involve some measure of control over production The solution of the problem would be for the State to take over all the lands in the commanded areas under its ownership and cultivation immediately before or after the construction of irrigation works But this is merely a counsel of perfection A practicable plan perhaps would be to organize the cultivators of irrigable lands on a co-operative basis for the purpose of production It would then be easier for the government to influence the production decisions of these co operative societies and use them as convenient agencies for the proper utilization of irrigation and other facilities

It needs to be emphasized that the state cannot afford to sit with folded hands and merely watch how additional facilities supplied at public cost are being utilized by the cultivators If considerations of expediency rule out the use of the apparatus of control then it would be merely academic to fix patterns of crops and targets of output The necessity of some sort of control over the use of facilities is also underlined by the fact unpalatable and

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(3) Epilogue

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suffering would be much higher The adoption of up to-date and elaborate plants and other labour saving devices would undoubtedly give us a larger flow of national income but it would also succeed in pushing labour out of employment

The short–term disturbances created in the social political and economical structure would be far more serious than can be dismissed with a shrug of shoulder In a totalitarian state it may be possible to suppress the distrubance and impose sacrifices by regimentation and dictation But in the community which aspires to preserve its democratic way of life these disturbances would create grave problems and imperil existance of the goverment For these reasons therefore the choice of appropriate production techniques ceases to be a purely economic problem It constitutes a political issue also

Even a superficial survey of the schemes included in the First Five Year Plan would show that these aspects of the problems particularly the overall limitataion of resources were not given due consideration While presenting the Report of the Planning Commission to Parliament in December 1952 the Prime Minister made an honest reference to this aspect of the problem He admitted that money would be tied up for a long period and there wou'd be no immediate increase in the current level of production The estimates of expenditure on these projects have been continuously revised upwards ever since these projects were drawn up and one does not know for certain how much more capital these projects are likely to absorb and also whether the benefit would be proportionate to the investment effort

There is no doubt that while preparing the river valley schemes we were very much influenced by the T V A model The over–zealou engineers in our country have finally succeeded in committing the government to the acceptance and execution of the schemes When the over solicitous experts overshoot their mark the consequences to the society are not always congenial At a certain stage in the economic development of a country such gigantic schemes become both feasible and desirable In this sense such schemes must be considered as the consequences and not the causes of economic development A poverty stricken country like India lacking in capital and skilled labour resources and always threatened with an explosion of human fertility should not start its economic progress with such costly schemes At some future stage of our economic growth these projects would become practicable even in our own country

Our criticism may appear pointless for the reason that work on these *projects is already in progress It is not suggested that the work of construction* on the projects shold be abandoned at this stage because they are costly Our criticism is intended to avert the repetition of old blunders We ought to be able to undertake such schemes as would not involve inordinate investment of capital and which would yield results in the not too distant a future